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SCHNABEL ENGINEERING ASSOCIATES RICHMOND VA
NATIONAL DAM SAFETY PROGRAM. TOMS CREEK DAM (INVENTORY NUMBER V--ETC(U)
SEP 79 J A WALSH

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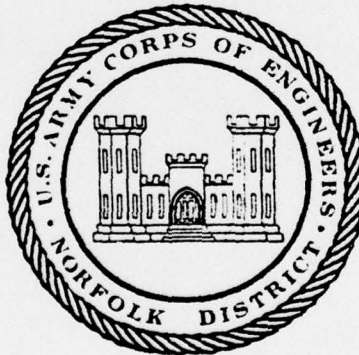
Name Of Dam: TOMS CREEK DAM
Location: WISE COUNTY, VIRGINIA
Inventory Number: VA. NO. 19510

LEVEL II

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

AD A 076661



PREPARED FOR
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

BY

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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

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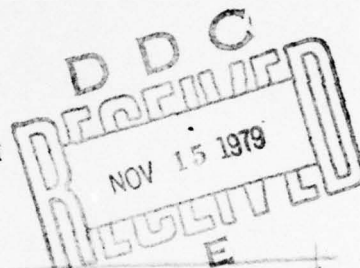
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⑥ National Dam Safety Program. Toms Creek
Dam (Inventory Number 19510), Wise County,
Virginia. Phase I Inspection Report.

(VA)

⑦ Final rept.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



⑪ Sep 79

⑩ James A. Walsh

⑫ 79

⑮ DACW65-79-D-0004

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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Name of Dam: Toms Creek Dam Va. No. 19510
State: Virginia
County: Wise
USGS Quad Sheet: Coeburn
Coordinates: Lat 36° 58.7' Long 82° 24.9'
Stream: Toms Creek
Date of Inspection: May 23, 1979

BRIEF ASSESSMENT OF DAM

Toms creek Dam is an unreinforced concrete double arch structure about 320 ft long and 36 ft high which includes a spillway 150 ft long by 3 ft deep. Water is discharged over the spillway section and drops into a riprap basin. The dam is located on Toms Creek about 2.3 miles northeast of Toms Creek, Virginia.

The dam serves as a water supply for the Town of Coeburn and is owned and maintained by the Town of Coeburn. The dam was constructed in 1964.

The spillway will pass 20 percent of the PMF. Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the appropriate spillway design flood (SDF) is the $\frac{1}{2}$ PMF. During the $\frac{1}{2}$ PMF, the dam will be overtopped to a depth of 1.8 ft maximum, at a maximum velocity of 6 fps, and will be overtopped for a period of 3 hours. The dam is rated inadequate but not seriously inadequate.

Overall, the dam appeared to be in very good condition at the time of the inspection. The actual structure appears to be similar to the design drawings.

An evaluation of the stability condition could not be made since sufficient design data, calculations, and construction data, were not available. A stability analysis was made with a Portland Cement Association computer program for a double-arch concrete dam. Based on review of the test boring data, the foundation and abutments are supported on competent rock suitable for support of the dam.

The visual inspection revealed no apparent problems concerning the safety of the dam. However, the following remedial measures are recommended:

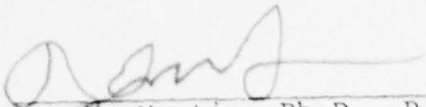
- (1) A staff gage should be installed to monitor water levels.

- (2) Action should be taken to prevent erosion at the dam abutments during periods of overtopping or careful observation of erosion is required in order that corrective measures can be taken immediately after erosion occurs.

- (3) The highway drainage pipe located above the right upstream abutment should be relocated in order to prevent slope erosion and future damage to the dam.

Prepared by:

SCHNABEL ENGINEERING ASSOCIATES, P.C./
J. K. TIMMONS AND ASSOCIATES, INC.



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Commonwealth of Virginia

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District Engineer

Recommended By:

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Carl S. Anderson, Jr.

SEP 27 1979

for Jack G. Starr, R.A., P.E.
Chief, Engineering Division

Date: _____



OVERVIEW PHOTOGRAPH

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TOMS CREEK DAM VA. NO. 19510

SECTION 1 - PROJECT INFORMATION

1.1 General:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (See Reference 1, Appendix V). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description: Toms Creek Dam is a concrete double arch structure approximately 320 ft long and 36 ft high. The crest is 5.4 ft wide and at an elevation of 2296 M.S.L. (See Plates 2-5, Appendix I.)

The spillway section is 150 ft long by 3 ft deep with a crest elevation of 2293 M.S.L. There is a 30-inch diameter inlet at elevation 2262 M.S.L. located below the crest, which is used to drain the lake, and two 8-inch water intakes located at elevation 2261 and 2253 M.S.L. (See Plate 6, Appendix I.)

1.2.2 Location: Toms Creek Dam is located on Toms Creek, 2.3 miles northeast of Toms Creek, Virginia, (See Sheet 1, Appendix I).

1.2.3 Size Classification: The dam is classified as a "small" size structure because of height and maximum storage.

1.2.4 Hazard Classification: The dam is located in a rural area; however, based upon the location of a home and water filtration plant approximately 300 ft downstream (See Photo 1, Appendix II), and the industrial development and several homes within 2 miles downstream of the dam, the dam is assigned a "significant" hazard classification. The hazard classification used to categorize a dam is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: The Town of Coeburn owns and operates the dam.

1.2.6 Purpose: Water supply for the Town of Coeburn.

1.2.7 Design and Construction History: The dam was constructed in 1964 and was designed and constructed under the supervision of Hayes, Seay, Mattern and Mattern, Engineers, for the Town of Coeburn.

1.2.8 Normal Operational Procedures: The spillway is ungated; therefore, water rising above the crest is automatically discharged downstream.

1.3 Pertinent Data:

1.3.1 Drainage Areas: The drainage area is 3.23 square miles.

1.3.2 Discharge at Dam Site: Maximum known flood at the dam site occurred in 1977; however, the pool elevation was not observed.

Spillway Discharge:

Pool at Crest of Dam (El 2296)	2572 CFS
--------------------------------	----------

1.3.3 Dam and Reservoir Data: See Table 1.1, below.

Table 1.1 DAM AND RESERVOIR DATA

Item	Reservoir				
	Elevation	Storage			
	Feet M.S.L.	Area Acres	Acre Feet	Watershed Inches	Length Miles
Crest of Dam	2296	3.3	51	.33	.2
Spillway Crest	2293	3.1	46	.30	.2
Streambed at Downstream Toe	2260	-	-	-	-

SECTION 2 - ENGINEERING DATA

2.1 Design: The dam was designed by Hayes, Seay, Mattern and Mattern of Roanoke, Virginia. Only design drawings and test boring logs with pressure test data were available. Design drawings are available at the Office of the Town Manager, Town of Coeburn, Virginia. The hydrologic and hydraulic design report was not available.

A subsurface investigation was conducted at the site by the engineer during the initial design stages. The investigation included the drilling of 10 core borings and pressure tests were made in 7 of the 10 holes. The complete design report was not provided; however, test boring logs and pressure test data are included in Appendix IV. Boring locations are shown on Plate 2, Appendix I.

The dam is an unreinforced, double-arch concrete structure. Design details are presented on Plates 2 through 6, Appendix I. A review of design drawings indicates a 15 ft wide trench was to be excavated into weathered rock (Elev. 2248.2 M.S.L.) along the centerline of the dam (Plate 5, Appendix I). All remaining unsuitable materials were to be removed and over-excavated areas were to be backfilled with concrete to elevation 2248.2, M.S.L. The excavation beyond 150 ft left and 100 ft right of center was planned to the top of sound rock until 50 ft from the abutments. Then the excavation was made to the top of weathered rock. A grout curtain consisting of a single line of primary grout holes spaced

at 10 ft on centers extended 17 ft below the sound rock line. The design specified that secondary grout holes may be required at intermediate spacings to complete the grout curtain. Trust blocks were to be constructed in the abutments. The structure was then constructed in individual rings as shown in design, Plate 2, Appendix I.

Referring to Plate 2, Appendix I, abandoned mine shafts exist approximately 150 ft below ground surface and immediately upstream from the structure.

2.2 Construction: The construction records are not available. The dam was constructed by Allegheny Construction Company of Roanoke, Virginia and was completed in 1964.

2.3 Operation: There are no known operation records.

2.4 Evaluation: Engineering calculations are not available, but the design drawings are representative of the dam and are good enough for review. There are no records available for dam performance.

SECTION 3 - VISUAL INSPECTION

3.1 Findings: The general condition of the dam was good at the time of inspection. Field observations are outlined in Appendix III.

3.1.1 General: An inspection was made 24 May 1979 and the weather was overcast with light rain and a temperature of 60°F. The pool elevation at the time of inspection was 2293.1 M.S.L. and the tailwater elevation was 2260.4 M.S.L., which corresponds to normal flows.

3.1.2 Dam and Spillway: The dam was in good vertical and horizontal alignment and construction joints showed no deterioration, except for some occasional effervescence staining. Some minor cracks were observed in the dam near the left abutment. There was no spalling of concrete on the dam or spillway and there was no evidence of any leaks. The 30-inch drain and the raw water intakes were operational, and they showed no signs of deterioration. The riprap at the plunge pool below the spillway was not eroded and appeared in good condition.

A small area directly above the contact of the dam and right abutment is eroding due to runoff water from a 30 inch CMP highway drain (See Photo No. 2, Appendix II). Erosion is occurring in the form of embankment sloughing.

Bedrock was not exposed in the abutments, but was present at scattered locations upstream and downstream from the dam in cuts along Route 652. The bedrock is essentially flat-lying and consists of alternating beds of sand-

stone and shale with occasional conglomerate and interbeds of coal. No faults were observed in the field during this investigation and geologic maps of the area do not show the presence of any faults in the immediate vicinity.

3.1.3 Reservoir Area: The reservoir area showed no debris and had side slopes of approximately 1:1. Only minor sloughing of bank slopes was observed. Sediment was observed at the upper end of the reservoir.

3.1.4 Downstream Area: The downstream channel showed no erosion or debris collection. The channel is well defined and is generally a narrow floodplain covered with brush and trees. Side slopes are approximately 2:1 at the edge of floodplain. The floodplain is approximately 100 ft wide except immediately below the dam where it is restricted to 30⁺ ft. One home and the water filtration plant are located approximately 300 ft downstream. They appear to be approximately 5 ft above the streambed. Additional homes and a coal handling operation are located along the stream floodplain over a 2 mile distance.

3.2 Evaluation:

3.2.1 Dam and Spillway: The dam was in very good condition at the time of inspection, and appurtenances (valves) were in good operational order. Increased sediment buildup in the reservoir and minor surface damage to the dam are likely as long as sloughing continues below the 30 inch CMP.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: Toms Creek Dam reservoir is used for water supply for the Town of Coeburn. The normal pool elevation is maintained by an overflow spillway which is the principal spillway. Water supply is constantly drawn off through two 8-inch lines. During periods of below normal flows water discharge is maintained through the dam by the demand for water supply. During periods of normal flows, the pool elevation is maintained slightly above the overflow spillway, and discharges downstream. Large increases in inflows, which cannot be absorbed by storage and the spillway, are passed over the non-overflow section when the pool rises above elevation 2296 M.S.L. There is a 30-inch drain pipe at elevation 2262 M.S.L. used to drain the reservoir.

4.2 Maintenance of Dam and Appurtenances: Maintenance is the responsibility of the Town of Coeburn. Maintenance consists of dam inspection and debris removal. The operating appurtenances are reportedly in working order.

4.3 Warning System: No warning system exists.

4.4 Evaluation: The dam and appurtenances are in good operating condition; and maintenance is routinely performed. The maintenance of the dam is adequate.

SECTION 5 - HYDRAULICS/HYDROLOGIC DATA

5.1 Design: No hydraulic/hydrologic data is available.

5.2 Hydrologic Records: There are no records available.

5.3 Flood Experience: The maximum pool elevation observed was in April of 1977. The pool elevation was not recorded, but it was observed that the outflow was contained within the spillway.

5.4 Flood Potential: In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. The Probable Maximum Flood (PMF), $\frac{1}{2}$ PMF, and 100-year Flood hydrographs were developed by the SCS method (Reference 4, Appendix V). Precipitation amounts for the flood hydrographs of the PMF, $\frac{1}{2}$ PMF, and 100-Year Flood are taken from the U. S. Weather Bureau Information (References 5 and 6, Appendix V). Appropriate adjustments for basin size and shape were accounted for. These hydrographs were routed through the reservoir to determine maximum pool elevations.

5.5 Reservoir Regulation: For routing purposes, the pool at the beginning of flood was assumed to be at elevation 2293 M.S.L. Reservoir stage-storage data and stage-discharge data were determined from the available plans, field measurement and USGS quadrangle sheets. Floods were routed through the reservoir using the spillway discharge up to a pool storage elevation of 2296 M.S.L. and a combined spillway and non-overflow section discharge for pool elevations above 2296 M.S.L.

5.6 Overtopping Potential: The predicted rise of the reservoir pool and other pertinent data were determined by routing the flood hydrographs through the reservoir as previously described. The results for the flood conditions (PMF, $\frac{1}{2}$ PMF, and 100 year Flood) are shown in the following Table 5.1.

TABLE 5.1 RESERVOIR PERFORMANCE

	Normal Flow	Hydrograph		
		100 Year	$\frac{1}{2}$ PMF	PMF
Peak Flow, CFS				
Inflow	3	1100	6,500	13,000
Outflow	3	1081	6,470	13,000
Maximum Pool Eleva- tion Ft, MSL		2294.68	2297.81	2299.94
Non-Overflow Section (El 2296 MSL)				
Depth of Flow, ft	-	-	1.81	3.94
Duration, Hours	-	-	3	5
Velocity, fps*	-	-	6	8.9
Spillway (El 2293 MSL)				
Depth of Flow, ft	-	1.68	4.81	6.94
Duration	-	10	12	12
Velocity, fps*	-	6	10.1	12.2
Tailwater Elevation, ft., MSL	2260.5	2263	2271.7	2276.8

* Critical Velocity at Control Section

5.7 Reservoir Emptying Potential: A 30-inch circular gate at elevation 2262 M.S.L. is capable of draining the reservoir through the 30-inch pipe. Assuming that the lake is at normal pool elevation (2293 M.S.L.) and there is 3 cfs inflow, it would take approximately 6 hours to lower the reservoir to elevation 2262 M.S.L.

5.8 Evaluation: Department of the Army, COE, guidelines indicate the appropriate spillway design flood (SDF) for a small size significant hazard dam is the 100 year flood to $\frac{1}{2}$ PMF. Because of the risk involved, the $\frac{1}{2}$ PMF has been selected as the SDF. The spillway will pass 20 percent of the PMF. The SDF will overtop the dam a maximum of 1.8 ft, and remain above the dam for 4 hours with a critical velocity of 6 fps. The SDF will also create a tailwater condition which will flood the area of the home located 300 ft downstream.

Hydrologic data used in the evaluation pertains to present day conditions with no consideration given to future development.

SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: Toms Creek Dam is located within the southeast edge of the Appalachian Plateau (locally Cumberland Plateau) Physiographic Province of Virginia. The dam site is underlain by rocks of the Norton Formation of Lower to Middle Pennsylvanian Age. This formation consists of alternate beds of sandstone and shale interbedded with coal. In Wise County the Norton Formation varies in thickness from 1300 to 1500 ft and thins in a northerly direction. Toms Creek Dam appears to be founded primarily on shale bedrock of the Norton Formation. The structure as built includes a grout curtain which extends 17 ft into sound bedrock. Design drawings are presented as Plates 2 through 6 of Appendix I. Test boring logs and related pressure test data are presented in Appendix IV.

Bedrock was not exposed in the abutments, but was present at scattered locations upstream and downstream from the dam and in cuts along Route 652. The bedrock is essentially flat-lying and consists of alternating beds of sandstone and shale with occasional conglomerate and interbeds

of coal. Test boring logs indicate the dam is underlain primarily by flat-lying slightly weathered shale. Interbeds of clay and fractured zones occur locally. The interbedded clay was usually encountered near the top of rock and decreased with depth. Rock core recoveries in the subsurface exploration program for the most part were greater than 90 percent. Sandstone with one coal bed was cored in the right abutment. Bedrock cored at the site was overlain by alluvial, colluvial, and residual soils which ranged in thickness from 5 to 24 ft. The overburden was generally described as consisting of sand, silt, and clay with gravel, cobbles, and boulders. No faults were observed in the field during this investigation and geologic maps of the area do not show the presence of any faults in the immediate vicinity.

6.2 Evaluation:

6.2.1 Foundation and Abutments: Arch dam foundations and abutments must be evaluated on the basis of potential settlement and seepage. Excessive settlement of the dam is not believed to be a problem because the structure rests upon fairly competent shale and sandstone bedrock.

Plate 2, Appendix I provides the approximate location for an interconnecting series of abandoned coal mine shafts. These shafts are shown to exist 150 ft[±] beneath the ground surface adjacent to but not under the dam, and beneath the reservoir. The locations shown are presented as accurately as could be determined from mine maps reviewed by the designer. The presence of the mine shafts has not apparently caused any problems.

Seepage was considered a problem in design because a grout curtain was specified. The pressure test data reflects the random and varied permeable condition within the bedrock. The planned grout curtain was to extend 17 ft into sound bedrock. Based upon the visual inspection and performance of the dam, it appears that the grouting was effective in controlling seepage through the bedrock.

The steep slopes which form the abutments were generally considered safe and stable at the time of investigation. One area of concern does exist along the upstream side of the right abutment. After construction of the dam the highway department placed a corrugated metal pipe beneath Route 652 to divert drainage from the north side of the road into the reservoir (to the right and above the bent handrail, Photo 2, Appendix II). Considerable erosion and sloughing directly related to the pipe have since occurred. In one instance during a period of heavy runoff, a large block of rock fell and damaged a section of handrail (Photo 2, Appendix II). The location of this drain pipe is detrimental to the normal operation

of the dam and it should be relocated downstream from the dam.

6.2.2 Stability Analysis: An evaluation of the stability of the dam could not be made since the design calculations were not available. The designer reportedly performed an analysis with a Portland Cement Association computer program for a double-arch concrete dam. A review of the geologic data and the test borings included in Appendix IV indicates that there are probably no adversely oriented weak planes within the rock of the foundation or abutments that would cause failure of the dam. The foundations and abutments appear to be founded on sound bedrock and the installation of the grout curtain also provides for a good foundation. Based upon the performance of the dam, it appears that the design was appropriate for the loading conditions.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: The Toms Creek Dam at the time of inspection appeared sound and in very good condition. The spillway will pass 20 percent of the PMF without overtopping. The SDF is the $\frac{1}{2}$ PMF, and the dam will be overtopped by 1.8 ft during the SDF. The dam is considered inadequate but not seriously inadequate.

Based on the visual inspection and review of existing data, there is no apparent problem that would require immediate action for the normal pool conditions. The structure appears to have been constructed essentially as shown on the design drawings. The stability analysis was not available at the time of the inspection; however, the analysis was made with a Portland Cement Association computer program for a double-arch concrete dam. The method of embedment of the dam into bedrock and the installation of a grout curtain provide a good foundation for this structure.

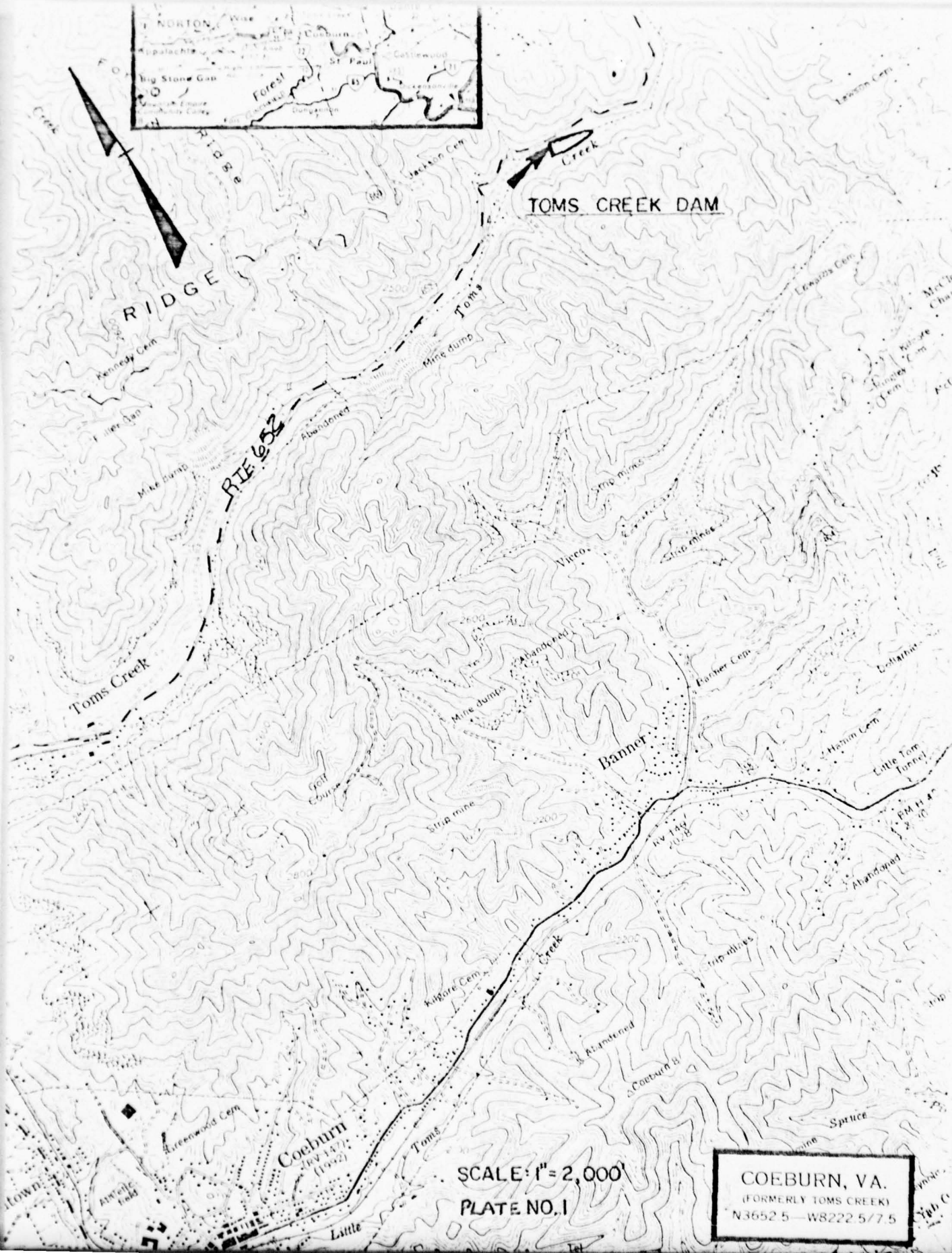
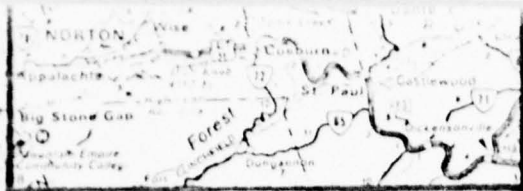
7.2 Remedial Measures:

7.2.1 A staff gage should be installed to monitor high water levels.

7.2.2 Protection against erosion of the dam abutments should be provided or the abutments should be monitored after intense flooding conditions.

7.2.3 The drainage pipe located above the right abutment should be relocated. Slope erosion associated with outflow from the pipe has already caused minor damage and we recommend it be relocated within the next six months, as to prevent future damage.

APPENDIX I
MAPS AND DRAWINGS



SCALE: 1" = 2,000'
PLATE NO. 1

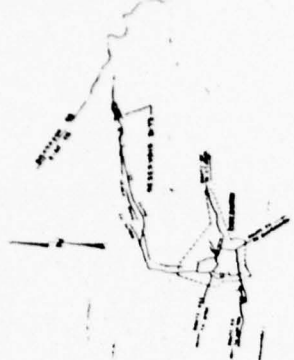
COEBURN, VA.
(FORMERLY TOMS CREEK)
N3652.5 - W8222.5/7.5

WATER IMPROVEMENTS

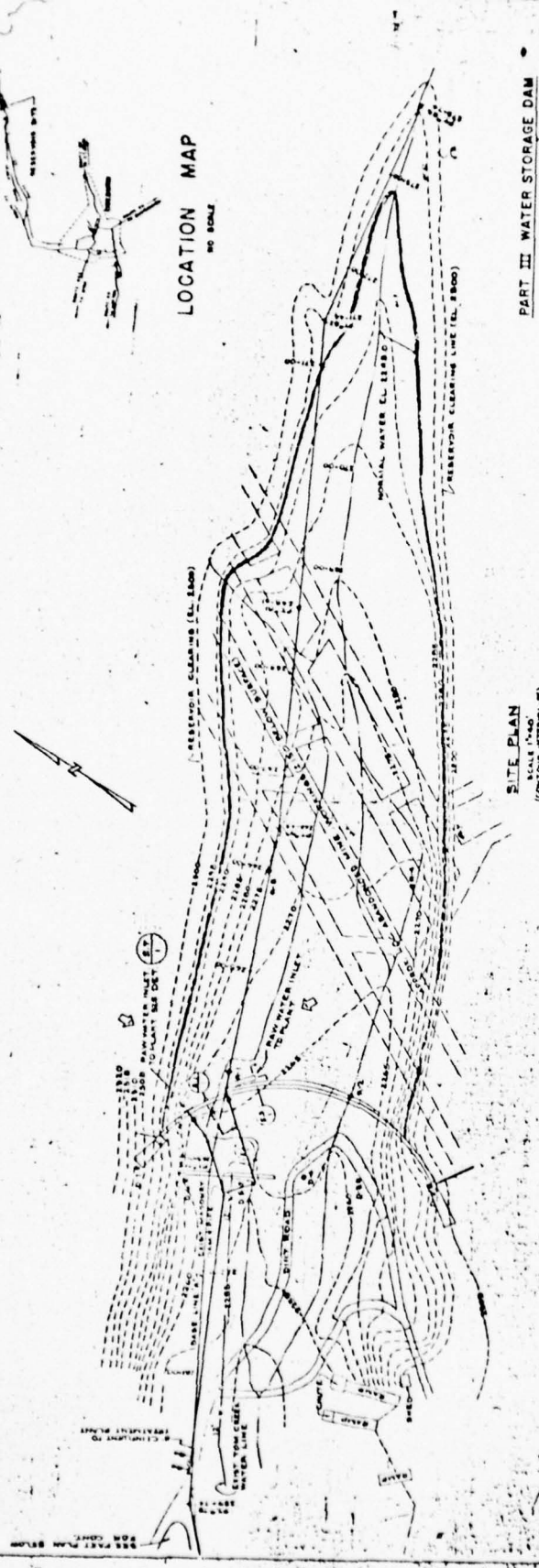
TOWN OF COEBURN

VIRGINIA

PROJECT NO. APW-VA-96



LOCATION MAP
NO SCALE



SITE PLAN
SCALE 1"=40'
(CONTINUOUS INTERVALS)

INDEX TO DRAWINGS

SHEET NO.	DESCRIPTION
1	TITLE SHEET & SITE PLAN
2	SITUATION PLAN
3	DIMENSIONAL LAYOUT
4	DETAILS
5	DETAILS

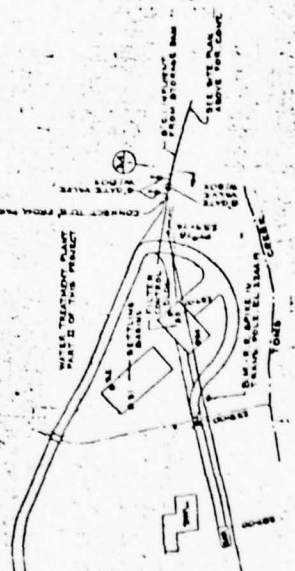
LEGEND

---	1000' - FIRST CONTOUR
---	1500' - FIVE' CONTOUR
---	20' - 20' SPACING

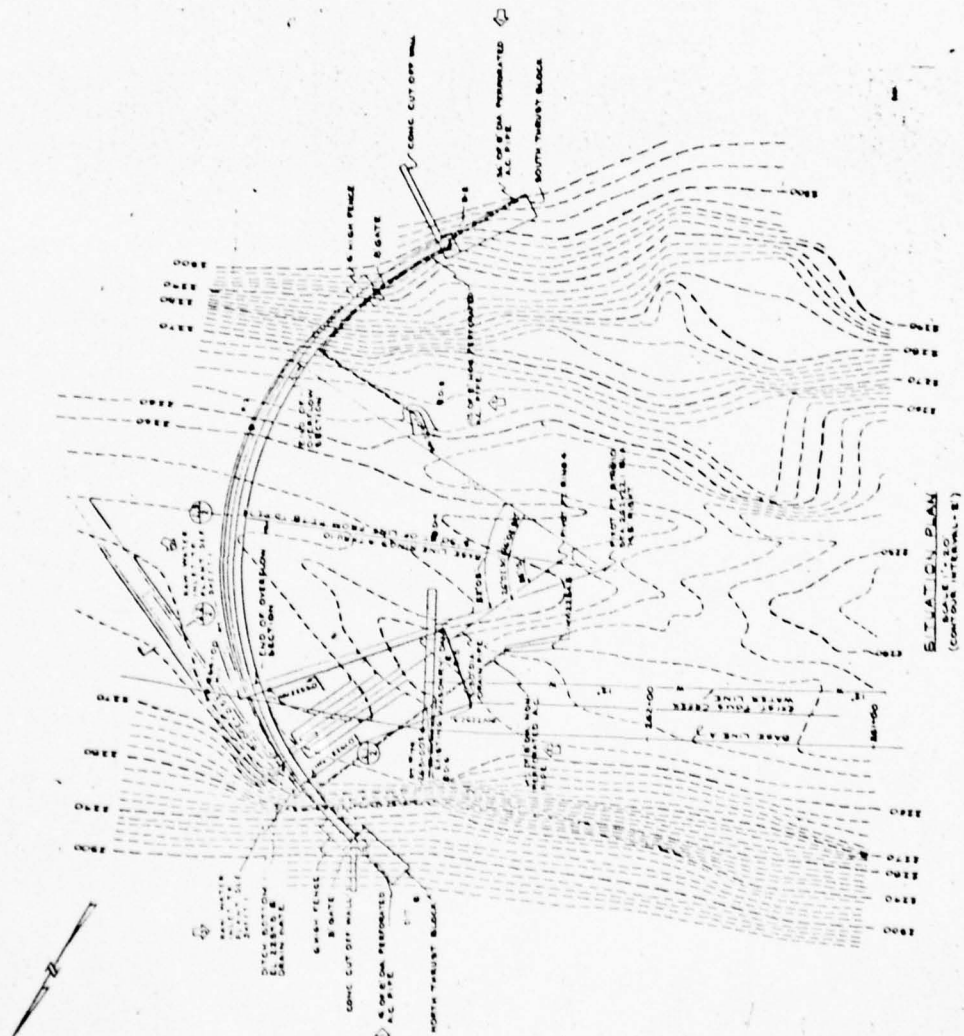
PLATE No. 2

DETAIL SYMBOLS
 DETAIL SYMBOLS
 DETAIL SYMBOLS

PROJECT APPR. SHEET	
DATE	1974-11-11
BY	1111-1111
TITLE SHEET & SITE PLAN	
PROJECT NO. APW-VA-96	
SHEET NO. 1	
SHEET TOTAL 5	
DATE 1974-11-11	
BY 1111-1111	



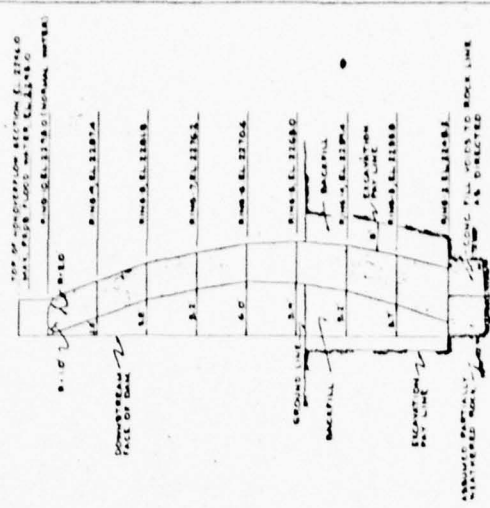
PART PLAN
SCALE 1"=40'



SECTION 11
SECTION 12

SECTION 11
SECTION 12

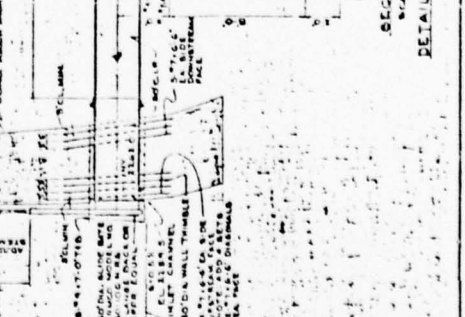
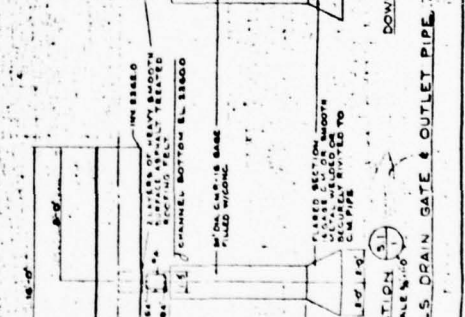
SITUATION PLAN	
DATE	1942
BY	ENGINEER
FOR	CONSTRUCTION
SCALE	1" = 100'
PROJECT	WATER CONTROL
NO.	11
DATE	1942
BY	ENGINEER
FOR	CONSTRUCTION
SCALE	1" = 100'
PROJECT	WATER CONTROL
NO.	11



SECTION 11
SECTION 12

SECTION 11
SECTION 12

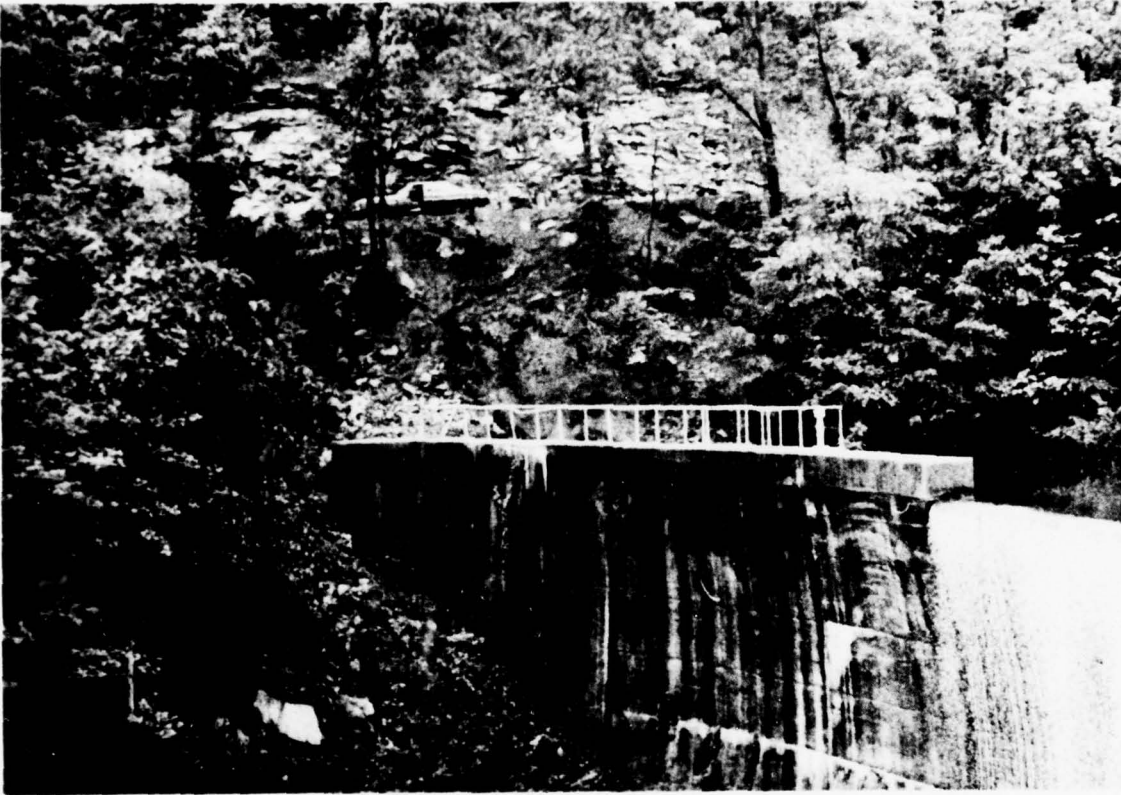
SITUATION PLAN	
DATE	1942
BY	ENGINEER
FOR	CONSTRUCTION
SCALE	1" = 100'
PROJECT	WATER CONTROL
NO.	11
DATE	1942
BY	ENGINEER
FOR	CONSTRUCTION
SCALE	1" = 100'
PROJECT	WATER CONTROL
NO.	11

[illegible]

APPENDIX II
PHOTOGRAPHS



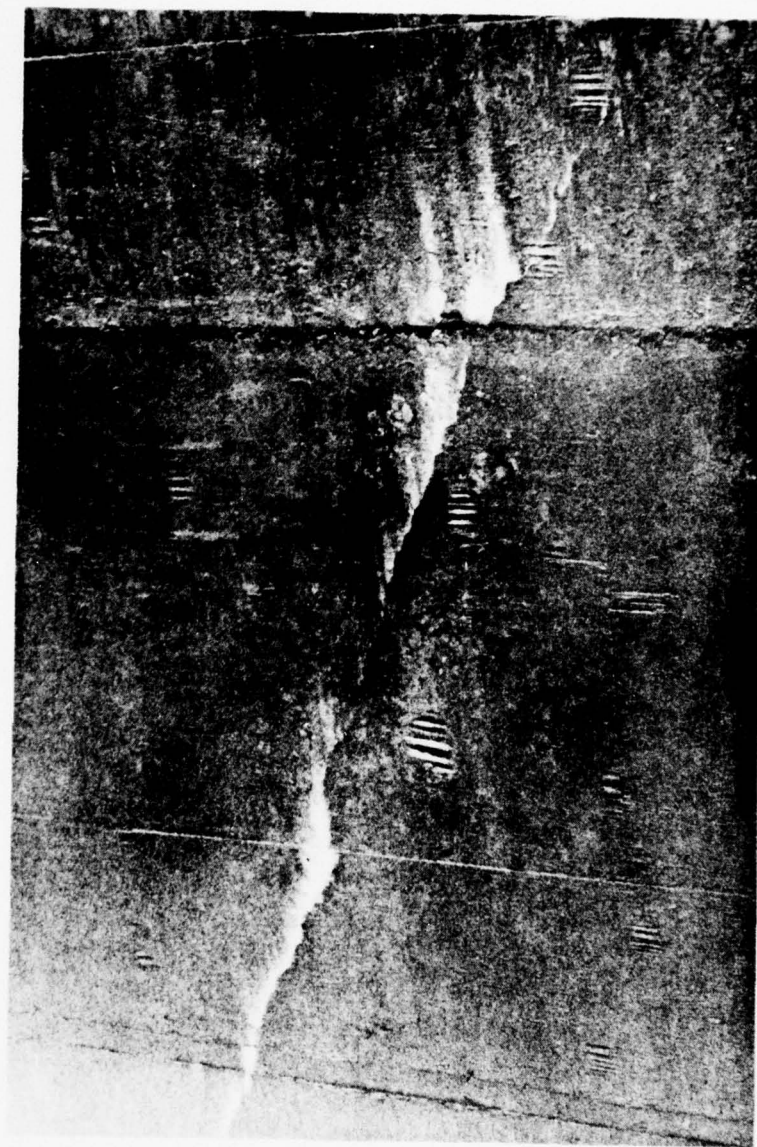
WATER TREATMENT PLANT DOWNSTREAM
(NOTE CARETAKER'S HOME, ARROW)



VIEW OF RIGHT ABUTMENT WHERE BOLDER
WASHED OFF ROAD ONTO WALKWAY (NOTE
BENT HANDRAIL)



VIEW OF COLD JOINT



CRACK IN SURFACE



SLOUGHING ABOVE LEFT ABUTMENT

APPENDIX III
FIELD OBSERVATIONS

•

FIELD OBSERVATIONS

Name of Dam: Toms Creek Va. No. 19510

County: Wise

State: Virginia

Coordinates: Lat 36° 58.7' Long 82° 24.9'

Date of Inspection: May 24, 1979

Weather: Overcast and light rain, temperature 60°F

Pool Elevation at Time of Inspection: Elevation 2293.1 MSL

Tailwater at Time of Inspection: 2260.4 MSL

Inspection Personnel:

Schnabel Engineering Associates, P.C.

Ray E. Martin, P.E.*

Stephen G. Werner (recorder)

J. K. Timmons and Associates, Inc.

Robert G. Roop, P.E.

William A. Johns (recorder)

State Water Control Board

Hugh Gildea, P.E.

Town of Coeburn, Virginia

Terry L. Gibson, Town Manager

1 Concrete/Masonry:

1.1 Seepage or Leakage: A damp spot was located on the face of the dam 3/4 way up and 3/4 way across from the right edge of the spillway. Construction joints exhibit some bleeding. The toe and abutments of the dam were back-filled with coarse rock, consequently any seepage occurring would not be visible unless it was great enough to flow above the coarse rock fill.

*Not present during May 24, 1979 inspection, but visited dam on June 11, 1979.

1.2 Structure to Abutment/Embankment Junction:

No bedrock is exposed at the junction. The contact is either thickly vegetated or covered with rock fill. Sandstone and shale outcrop is exposed along the right downstream portion of the abutment. Steep residual soil slopes occur on the upstream abutment edges. A shale slope with a thin coal seam occurs along the right upstream slope. The bedrock is flat lying. A 30 inch[±] highway drain expells water on the upper portion of the right abutment, causing a slope stability problem.

1.3 Drains: 30 inch gated drain.

1.4 Water Passages: Two 8 inch water lines.

1.5 Foundation: Not observable, but design called for the structure to be keyed into bedrock. Outcrops exposed along the adjacent road consist of fine to coarse gravel, massively bedded sandstone with a basal conglomerate overlying gray shale. The sandstone is gray to brown and weathers spheroidally. The bedrock is essentially flat lying.

1.6 Surface Cracks, Concrete Surfaces: Minor cracks were observed on left abutment. Only one thin crack, approximately 10 ft long and at a 60 degree angle across the left downstream face, was encountered. It is patched and is located near the left abutment.

1.7 Structural Cracking: None observed.

1.8 Vertical and Horizontal Alignment: Good.

1.9 Monolith Joints: Good condition.

1.10 Construction Joints: Good condition.

1.11 Erosion of Abutment Slopes: The only erosion observed is just below the outlet to the drain pipe above the right abutment. Water from one side of the road is diverted under the road, expelled on the right abutment slope and drains downward into the reservoir.

2 Ungated Spillway:

2.1 Concrete Weir: Good Condition.

2.2 Approach Channel: None

2.3 Discharge Channel: Riprap pool in good condition.

2.4 Bridges and Piers: None

3 Reservoir: In good condition, steep slopes, no debris noticed.

3.1 Slopes: Steep natural heavily wooded slopes with numerous rock outcrops bound the reservoir. Slopes appeared stable and only minor sloughing was observed.

3.2 Sedimentation: Some sediment buildup indicated on the upper lake reaches. Sounding at dam face indicated no build-up. The Town of Coeburn has a sediment removal program.

4 Downstream Channel:

4.1 Condition: Brush covered.

4.2 Slopes: Steep natural heavily wooded rock slopes bound the channel. There was no observed evidence of slides.

4.3 Population and Facilities: One home and the filtration plant exist approximately 300 ft below the dam. Coal loading operation and various homes several miles below dam.

5 Instrumentation:

5.1 Monumentation: None

5.2 Observation Wells and Piezometers: No observation wells or piezometers were located during our field observations.

APPENDIX IV
TEST BORING LOGS
AND
PRESSURE TEST DATA
BY
HAYES, SEAY, MATTERN AND MATTERN

Location COEBURN, Va.

BORING LOG

Structure RESERVOIRComm. No. 897-AGeologist AmgSheet 1 of 2Contractor C.C.D.

Engineer

Boring No. R-1Date 25 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>430'</u>
							Rock <u>35.0'</u>
							Wt of hammer <u>140^{lb}</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>58.6</u>
<u>65.8</u>	<u>0.0</u>						REMARKS
							<u>W.T. 0.24 hrs. 7.2</u>
			<u>OVERBURDEN AND ALLUVIUM - Sand, clay, gravel, cobbles & boulders.</u>				<u>Casing Bit to 80 ft.</u>
<u>57.8</u>	<u>8.0</u>		<u>soft, med. soft, med. fdk. gray, weathered, thinly bedded SHALE</u>				<u>core rec. 8.0 to 13.5</u>
<u>55.8</u>	<u>10.0</u>						<u>91%</u>
<u>54.3</u>	<u>11.5</u>		<u>5-ft. clay zone</u>				
<u>53.7</u>	<u>12.1</u>						<u>lost circ. - 13.5</u>
<u>52.3</u>	<u>13.5</u>						
<u>47.8</u>	<u>18.0</u>						<u>25% return of circ. @ 18 ft.</u>
<u>45.8</u>	<u>20.0</u>						
<u>43.8</u>	<u>22.0</u>		<u>Increase in fracturing and weathering - 22.0 to 27.6</u>				<u>core rec. 13.5 to 23.5</u>
<u>42.3</u>	<u>23.5</u>		<u>badly broken, fractured and weathered</u>				<u>93%; less believed to be 22.0 to 23.5</u>
<u>38.2</u>	<u>27.6</u>						<u>core rec. 23.5 to 33.5</u>
							<u>95%</u>

Location Ceburn, Va.

Contractor C. C. D.

Structure Reservoir
Geologist J.F.P.
Engineer

Comm. No. E97-A
Sheet 2 of 2
Boring No. R-1
Date 25 June 1963

[illegible]

Boring R-1

Test #1 (30 ft. to 35 ft.)

10 psi. - 0.8 gpm.

20 psi. - 0.0 gpm.

30 psi. - 0.0 gpm.

20 psi. - 0.0 gpm.

10 psi. - 0.0 gpm.

Test #2 (35 ft. to Bot. [43.0])

No pressure - 13.8 gpm.

Test #3 (27 ft. to 32 ft.)

10 psi. - 0.5 gpm.

20 psi. - 0.5 gpm.

30 psi. - 0.2 gpm.

20 psi. - 0.0 gpm.

10 psi. - 0.0 gpm.

Test #4 (17 ft. to 22 ft.)

8 psi. (max) - 13.5

Test #5 (22 ft. to Bot. [43.0])

No pressure - 14.0 gpm.

Test #6 (12 ft. to 17 ft.)

5 psi. (max) - 14.0 gpm.

Test #7 (22.5 ft. to 27.5 ft.)

No pressure - 14.8 gpm.

Suction (all valves open) - 12.0 gpm.

Location COEBORN, Va

BORING LOG

Structure RESERVOIRComm. No. 897-AGeologist BingSheet 1 of 1Contractor C.C.DEngineer P.Boring No. R-2Date 4 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>30.3'</u>
							Rock <u>15.5'</u>
							Wt of hammer <u>140*</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>51.0</u>
							REMARKS
<u>570</u>	<u>0.0</u>						
<u>490</u>	<u>10.0</u>						
<u>45.0</u>	<u>10.0</u>						
<u>44.7</u>	<u>10.3</u>						
<u>44.5</u>	<u>10.5</u>						
<u>44.2</u>	<u>10.8</u>						
<u>408</u>	<u>10.2</u>						
<u>390</u>	<u>20.0</u>						
<u>34.5</u>	<u>24.5</u>						
<u>300</u>	<u>30.0</u>						

OVERBURDEN
ALLUVIUM - sand, silt,
clay, cobbles & boulders

soft, brown weathered, lt. gray
SHALE.
soft to med. hard, partially wea-
thered SHALE.

hard to med. hard slightly
weathered dark gray SHALE
slightly sandy
weathering decreasing
with depth.

Core rec. 14.5 to 24.5
95%

Core rec. 24.5 to 30.3
98%

see over for
test results.

Boring R-2

void

Test #1

13 psi.	13.9 gpm	} packers at 14.8 & 19.6 - <u>look around packer.</u>
26	13.5	
13	5.5	

#2

13 psi.	28.9 gpm	} 20 ft. to 30.3 ft. (bottom)
26	6.5	
13	1.2	

#3

13 psi.	4.9 gpm	} packers at 16.5 & 21.5
26	5.0	
13	.7	

#4

13 psi.	4.9 gpm	} 21.5 to 30.3 ft. (bottom)
26	5.5	
13	1.2	

Location COCURN, VA

BORING LOG

Structure RESERVOIRComm. No. 897-AGeologist Paul J. P.Sheet 1 of 2Contractor C.C.D.

Engineer

Boring No. R-3Date 20 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>51.9'</u>
<u>13.0</u>	<u>0.0</u>						Rock <u>26.8'</u>
							Wt of hammer <u>140^{lb}</u>
							Av fall of ham <u>30"</u>
							El of grd. water
							REMARKS
							W.T. @ 12 hrs. - Hole cratered. Could not take water table.
<u>63.0</u>	<u>10.0</u>						Casing Bit to 22.6
<u>53.0</u>	<u>20.0</u>						
<u>51.5</u>	<u>21.5</u>						
<u>50.4</u>	<u>22.6</u>		soft, 1/2 gray, very weathered interbedded CLAY & SHALE Plastic.				put in core barrel 22.6
<u>47.9</u>	<u>25.1</u>						core rec. 22.6 to 26.1 62%
<u>46.9</u>	<u>26.1</u>		Med. soft to med, 1/2 gray thinly bedded, highly famed, weathered SHALE				
							core rec 26.1 to 31.9

Location COEBURN, VA

BORING LOG

Comm. No. 897-17Structure ReservoirSheet 1 of 2Geologist Long J. FordBoring No. R-4Contractor C.C.D.

Engineer

Date 21 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>52.6</u>
<u>63.0</u>	<u>0.0</u>						Rock <u>44.1</u>
							Wt of hammer <u>140^{lb}</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>68.0</u>
							REMARKS
							<u>water table @ 12 hrs.</u> <u>freed from top</u> <u>of casing</u>
<u>59.5</u>	<u>8.5</u>						
<u>58.0</u>	<u>10.0</u>						
			<u>soft to med. d. lt. gray,</u> <u>weathered, thinly bedded</u> <u>SHALE</u>				<u>core rec. 8.5 to 13.0</u> <u>95%</u>
<u>55.0</u>	<u>13.0</u>						
							<u>core rec. 13.0 to 23.0</u> <u>100%</u>
<u>48.0</u>	<u>20.0</u>		<u>No changes in lithology</u>				
<u>45.0</u>	<u>23.0</u>		<u>Weathering in SHALE</u> <u>gradually decreases with depth.</u> <u>Hardness increases with depth.</u>				<u>see over for</u> <u>Test Results</u>
							<u>cores 23.0 to 52.6</u> <u>100%</u>

Location Asburn, Va. BORING LOG Structure Reservoir Comm. No. 297-A
 Contractor C.C.D. Geologist JEP Sheet 2 of 2
 Engineer JEP Boring No. R-4
 Date 21 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>52.6</u>
<u>38.0</u>	<u>30.0</u>						Rock <u>44.1</u>
							Wt of hammer <u>140^{lb}</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>68.0</u>
							REMARKS
							core rec 230 to 32.6
							100%
<u>35.4</u>	<u>32.6</u>		Mat. hard to hard, lt. gray, very slightly weathered, thinly bedded SHALE				
							lost circ @ 35.6
<u>32.4</u>	<u>35.6</u>						core rec 32.6 to 42.6
							100%
<u>28.0</u>	<u>40.0</u>						
<u>25.4</u>	<u>42.6</u>						
							core rec 42.6 to 52.6
							100%
<u>18.0</u>	<u>50.0</u>						
<u>15.4</u>	<u>52.6</u>		Bottom of hole				

Boring R-4

Test #1 (packers 9ft-14ft)

10 psi. - 0.8 gpm.
20 psi. - 6.6 gpm.
22 psi. (max) - 10.5 gpm.
Blowout
10 psi. - 13 gpm.

Test #2 (14ft. to Bot. [52.6])

10 psi. - 7.5 gpm.
20 psi. - 6.3 gpm.
30 psi. - 6.8 gpm.
20 psi. - 5.3 gpm.
10 psi. - 1.5 gpm.

Test #3 (14ft. to 19ft)

10 psi. - 0 gpm.
20 psi. - 0 gpm.
30 psi. - 0 gpm.
20 psi. - 0 gpm.
10 psi. - 0 gpm.

Test #4 (19ft. to Bot. [52.6])

No pressure - 14.5 gpm.

Test #5 (19ft. to 24ft)

10 psi. - 0.3 gpm.
20 psi. - 1.3 gpm.
30 psi. - 1.8 gpm.
20 psi. - 1.5 gpm.
10 psi. - 0.3 gpm.

Test #6 (24ft. to Bot. [52.6])

No pressure - 13.5 gpm.
Suction - all valves open - 5.0 gpm.

Test #7 (24ft. to 29ft)

10 psi. - 0.8 gpm.
20 psi. - 1.8 gpm.
30 psi. - 3.3 gpm.
20 psi. - 1.8 gpm.
10 psi. - 0.5 gpm.

Test #8 (29ft. to Bot. [52.6])

No pressure - 13.5 gpm.

Test #9 (29ft. to 34ft)

10 psi. - 0.3 gpm.
20 psi. - 1.3 gpm.
30 psi. - 1.8 gpm.
20 psi. - 1.8 gpm.
10 psi. - 0.5 gpm.

Test #10 (34ft. to Bot. [52.6])

No pressure - 13.5 gpm.

Test #11 (34ft. to 39ft.)

10 psi. - 0.3 gpm.
20 psi. - 0.5 gpm. LOST WATER
30 psi. - 0.3 gpm. @ 35.6'
20 psi. - 0.0 gpm.
10 psi. - 0.0 gpm.

Test #12 (39ft. to Bot. [52.6])

No pressure - 13.5 gpm.

Location COEBURN, VA

BORING LOG

Structure DAM SITEComm. No. 897-AGeologist EWJSheet 1 of 3Contractor C.C.D

Engineer

Boring No. D-2Date 10 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>73.3'</u>
<u>93.9</u>	<u>0.0</u>						Rock <u>49.6'</u>
							Wt of hammer <u>140^{lb}</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>—</u>
							REMARKS
							<u>Wt. 24 hrs. Hole craters</u> <u>could not take water table.</u> <u>Fishtail to 30 ft.</u>
	<u>3.0</u>		<u>OVERBURDEN.</u>				<u>3.0 ft. - put on</u> <u>casing bit.</u>
			<u>RESIDUUM clay, few</u>				<u>NOTE:</u>
			<u>boulders & weathered</u>				<u>PRESSURE TESTING ON</u>
			<u>sandstone</u>				<u>BACK OF SHEET.</u>
<u>88.9</u>	<u>10.0</u>						
							<u>casing bit to</u> <u>237</u>
<u>78.9</u>	<u>20.0</u>						
<u>75.2</u>	<u>23.7</u>						<u>25.8 to 26.3. badly</u> <u>weathered.</u>
			<u>11. gray, soft to med. hard</u>				
			<u>med. thinly bedded, weathered</u>				
			<u>SHALE</u>				<u>core rec. 23.7 to 33.7</u> <u>96%.</u>

BORING LOG

Location Coeburn, VirginiaStructure Dam SiteComm. No. E97-ASheet 2 of 3Contractor C.C.D.Geologist J.P.Boring No. D-2

Engineer

Date 11 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>73.3'</u>
61.9	32.0						Rock <u>49.6'</u>
							Wt of hammer <u>140#</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>—</u>
							REMARKS
							<u>WT @ 24 hrs.</u>
65.2	33.7						<u>Core rec. 33.7 to 43.6</u>
							<u>100%</u>
61.4	37.5		<u>Med. light, lt. to med. gray</u>				
			<u>slightly weathered SHALE</u>				
58.8	40.0						
	40.1						
55.3	43.1		<u>Med. hard to hard, lt. gray</u>				
			<u>slightly weathered, thinly</u>				
			<u>bedded SHALE. Very small</u>				
			<u>am. fracturing</u>				
							<u>Core rec. 43.6 to 53.6</u>
							<u>100%</u>
50.4	48.5						<u>NOTE</u>
							<u>48.5 partial loss circ.</u>
45.3	53.6		<u>No change in lithology</u>				
							<u>Core rec. 53.6 to 63.6</u>
							<u>100%</u>
38.9	60.0						

Location Barboursville BORING LOG Structure Deep Site Comm. No. 897-A
 Geologist J. H. H. Sheet 3 of 3
 Contractor C.C.D. Engineer J. H. H. Boring No. D-2
 Date 11 June 63

Date 11 June 63

Engineer

[illegible]

D-2

12 JUNE 1963

7:30 AM - 9:30 AM

PRESSURE TESTING

T-1 EI - 72.9 - 47.9
Depth 26' - 31'

10 psi	2.1 gpm
20	4.4
30	10.0

10 psi	4.1 gpm
20	7.0
30	13.0
20	9.4
10	6.4

T-2 EI - 67.9 - 25.6
Depth 31' - 73.3'

20 psi	8.5 gpm
30	10.8
20	8.0

T-3 EI - 52.9 - 47.9
Depth 46' - 51'

10 psi	6.3 gpm
20	8.1
30	8.5
20	6.5
10	5.8

T-4 EI - 47.9 - 25.6
Depth 51' - 73.3'

10 psi	1.3 gpm
20	1.8
30	1.8
20	1.8
10	1.3

Location COEBURN, VA.

BORING LOG

Structure DAM SITEGeologist Ray J. Hill

Engineer

Comm. No. 897-ASheet 1 of 2Boring No. D-3Date 12 June 1963Contractor C.C.D.

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>64.1</u>
							Rock <u>50.9</u>
							Wt of hammer <u>140^{lb}</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>55.0</u>
							REMARKS
<u>62.5</u>	<u>0.0</u>		<u>OVERBURDEN</u>				<u>Wt. @ 24 hrs. 2.5</u>
			<u>ALLUVIUM - sand, clay,</u>				
			<u>cobbles and boulders</u>				
<u>52.5</u>	<u>10.0</u>						<u>casing bit to 14.1</u>
<u>49.3</u>	<u>13.2</u>		<u>lt gray, soft med. hard med.</u>				
<u>48.4</u>	<u>14.1</u>		<u>dense, weathered SHALE.</u>				
			<u>Intermittent to 24' clay weathering</u>				
			<u>partings and clay. Soil weathering</u>				
			<u>Clay is dark brown, elastic.</u>				
			<u>shale is thin bedded.</u>				
							<u>core rec. 14.1 to 24.1</u>
<u>48.5</u>	<u>20.0</u>						<u>91%</u>
<u>38.4</u>	<u>24.1</u>		<u>weathering and clay partings</u>				<u>core 24.1 to 34.1</u>
			<u>decrease with depth</u>				<u>99%</u>
<u>36.2</u>	<u>28.3</u>		<u>Med. hard, dense, thin med. gray</u>				<u>5.1' core unbroken</u>
			<u>slightly weathered SHALE.</u>				
			<u>thinly bedded.</u>				

BORING LOG

Location Cochran, Va.Structure Dam siteComm. No. 597-ASheet 2 of 2Geologist W. H. R.Boring No. D-2Contractor C.C.D.Engineer Date 13 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>64.1</u>
							Rock <u>50.9</u>
							Wt of hammer <u>140^{lb}</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>55.0</u>
							REMARKS
<u>32.5</u>	<u>32.0</u>		<u>med hard, dense, lt. tan & gray slightly weathered, thin bedded SHALE</u>				
							<u>core rec 24.1 to 34.1 99%</u>
<u>28.4</u>	<u>34.1</u>						
<u>26.1</u>	<u>36.4</u>						<u>complete loss. core. 36.4</u>
<u>22.5</u>	<u>40.0</u>						
							<u>core rec. 34.1 to 44.1 100%</u>
<u>18.4</u>	<u>44.1</u>		<u>No change in lithology</u>				<u>3.7 ft. core unbroken.</u>
<u>12.5</u>	<u>50.0</u>						<u>Core rec. 44.1 to 54.1 100%</u>
<u>8.4</u>	<u>54.1</u>						<u>core rec. 54.1 to 64.1 99%</u>

D-3

PRESSURE TESTS.

NOTE: High flows would not permit a pressure greater than 10psi in T-1, T-2 and T-3.

T-1 EI - 42.5 28.4
 Depth 20.0' - 34.1'

10 psi 10.5 gpm.
10 psi 15.5 gpm.

T-2 EI - 47.5 42.5
 Depth 15.0' - 20.0'

10 psi 12.8 gpm
10 psi 14.3 gpm.

T-3 EI - 42.5 37.5
 Depth 20.0' - 25.0'

10 psi 15 gpm.

T-4 EI - 37.5 28.4
 Depth 25.0' - 34.1'

10 psi 0 gpm
20 psi 0 gpm
30 psi 0 gpm.

T-5 Depth 26.0 to 64.1 - No pressure - No test.

T-6 EI 36.5 31.5
 Depth 26.0' - 31.0'

10 psi 0 gpm
20 psi 0 gpm.
30 psi 0 gpm.
20 psi 0 gpm.

T-7 Depth 31.5 to 64.1
 No pressure - 15 gpm.

T-8 EI 31.5 26.5
 Depth 31.0 to 36.0
 10 psi - 0 gpm.
 20 psi - 0 gpm

D-3

T-9

^{26.5}
Depth 36.0 to 64.1
No pressure - 179 gpm.

T-10

^{26.5} ^{21.5}
Depth 36 to 41
No pressure 16.8 gpm.

T-11

^{21.5}
Depth 41 to 64.1
10 psi - 0.5 gpm.
20 psi - 0 gpm
30 psi - 0 gpm
20 psi - 0 gpm
10 psi - 0 gpm

Location COEBURN, VA BORING LOG Structure DAM SITE Comm. No. 897-A
 Geologist Eng. [Signature] Sheet 1 of 2
 Contractor C.C.D. Engineer [Signature] Boring No. D-4
 Date 4 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>62.5</u> Rock <u>40 ft</u> Wt of hammer <u>140</u> Av fall of ham <u>30"</u> El of grd. water <u>56.2</u>
<u>60.2</u>	<u>0.0</u>						REMARKS
							<u>WT @ 24 hrs. 4.0 ft.</u> <u>fish tail to 14.1</u>
			<u>OVERBURDEN</u>				
			<u>ALLUVIUM sand,</u> <u>silt, clay, cobbles & very</u> <u>large nodules of coarse</u> <u>micaceous, badly weathered</u> <u>SANDSTONE</u>				
							<u>Casing bit to 22.0 ft</u>
<u>46.1</u>	<u>14.1</u>						<u>Core rec. 14.1 to 22.5</u> <u>32%</u>
<u>40.7</u>	<u>19.5</u>		<u>lt. gray, plastic, very hard</u> <u>WEATHERED SHALE & CLAY</u>				
	<u>20.0</u>						
<u>37.7</u>	<u>22.5</u>		<u>med. to dark gray, silt to</u> <u>med. hard, weathered SHALE</u> <u>with intermittent clay (1/4)</u> <u>partings,</u>				<u>Core rec. 22.5 to 32.5</u> <u>90%</u>
<u>34.8</u>	<u>25.7</u>		<u>lt. to med. gray med. hard</u> <u>lightly weathered SHALE</u> <u>occasional clay parting (1/8 - 1/4)</u>				

Location Cockeysville, Va.Contractor C.C.D.

BORING LOG

Structure Dam SiteGeologist J. H. R.Engineer J. H. R.Comm. No. 897-1Sheet 2 of 2Boring No. D-1Date 5 June, 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>62.5</u>
							Rock <u>40 ft</u>
							Wt of hammer <u>140 lb</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>56.2</u>
							REMARKS
<u>30.2</u>	<u>30.0</u>						Core rec. <u>22.5 to 32.5</u>
							<u>98%</u>
<u>27.7</u>	<u>32.5</u>		<u>Med. hard to hard, light gray, light dense, very slightly weathered SHALE. Weathering decreases, and hardness increases with depth.</u>				
							Core rec. <u>32.5 to 42.5</u>
							<u>99%</u>
<u>19.7</u>	<u>40.0</u> <u>40.5</u>		<u>* NOTE.</u>				NOTE: Last penetration at <u>40.5 ft</u>
<u>17.7</u>	<u>42.5</u>						No return below <u>40.5'</u>
							Core recovery <u>42.5 to 52.5</u>
							<u>99%</u>
<u>7.7</u>	<u>52.5</u>						Core rec. <u>52.5 to 62.5</u>
							<u>96%</u>
<u>0.2</u>	<u>60.0</u>						

Location COFFBURN, Va.

BORING LOG

Structure DAM SITEComm. No. 897-AGeologist LongSheet 1 of 3Contractor C.C.D.

Engineer

Boring No. D-5Date 17 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>65.7</u>
<u>57.7</u>	<u>0.0</u>						Rock <u>50.4</u>
							Wt of hammer <u>140^{lb}</u>
							Av fall of ham <u>30"</u>
							El of grd. water
							REMARKS
							<u>wt. of hole plate</u> <u>checked could not</u> <u>take water table.</u>
<u>49.9</u>	<u>10.0</u>						
<u>44.6</u>	<u>15.5</u>						
<u>44.4</u>	<u>15.5</u>						
<u>40.6</u>	<u>19.3</u>						
<u>39.9</u>	<u>20.0</u>						
<u>34.4</u>	<u>25.5</u>						
<u>29</u>	<u>30.0</u>						

ALLUVIUM. sand clay
boulders & cobbles.

Coring bit to 15.5

soft to med. dk. gray, badly
weathered shales & clay
of SHALES SANDSTONE
Thin lenses of clay (plastic)
light fracturing SANDSTONE
very fine grained shale thin
bedded.

partial loss coring

core rec 15.5 to 25.5
91%

soft to med. dk. gray, sandy
med. thin bedded SHALES
cracked clay partings 2' to 3'
thick.

clay partings 1/2 to 1/2"

core rec 25.5 to 35.5
100%

Weathering decreasing with
depth.

see over for
Test Results

BORING LOG

Comm. No. *597-A*

Structure *Same as 1e*

Sheet 2 of 3

Geologist 

Boring No. *D-5*

Engineer

Date *17 June 1963*

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole 65.7 Rock 50.4 Wt of hammer 140 ^{lb} Av fall of ham 30" El of grd. water REMARKS
29.9	30.0						
28.8	31.1		Very fine grained, med. hard to hard, slightly weathered, lt. gray SANDSTONE. Tight and dense.				core rec. 25.5 to 35.5 100%
26.7	33.2						
24.4	35.5						
			Med. hard, lt. gray, slightly weathered, thin bedded, SHALE. Clay partings 3 to 4 apart.				
19.9	40.0						core rec. 35.5 to 45.7 100%
			No change in lithology				
14.2	45.7						core rec. 45.7 to 55.7 100%
9.9	50.0						
8.9	51.0		slight increase in weathering between depth 51.0 ft. and 55.2 ft.				
4.7	55.2						
			No change in lithology				core rec. 55.7 to 65.7 99%

Comm. No. 27-A

Structure Dam Site

Sheet 3 of 3

Geologist W. H. H. H.

Boring No. D-5

Engineer _____

Date 17 June 1963

[illegible]

D-5

EI-44.4 - 39.4
Test #1 (15.5 to 20.5)
10 psi. - 13.8 gpm.
17 psi. (max) - 15.5 gpm.
10 psi. - 13.5 gpm.

EI-39.4
Test #2 20.5 to Bot. (65.7)
10 psi. - 10.8 gpm.
20 psi. (max) - 12.5 gpm.
10 psi. - 11 gpm.

EI-39.4 - 34.4
Test #3 20.5 to 25.5
10 psi. - 9 gpm.
20 psi. - 13 gpm.
25 psi. (max) - 16.3 gpm.
20 psi. - 12.5 gpm.
10 psi. - 9.8 gpm.

EI-34.4
Test #4 25.5 to Bot. (65.7)
10 psi. - 4 gpm.
20 psi. - 6.3 gpm.
30 psi. - 7.5 gpm.
20 psi. - 5.3 gpm.
10 psi. - 4.5 gpm.

EI-34.4 - 29.4
Test #5 (25.5 to 30.5)
10 psi. - 2.8 gpm.
20 psi. - 3.0 gpm.
30 psi. - 4.0 gpm.
20 psi. - 2.8 gpm.
10 psi. - 2.5 gpm.

EI-29.4
Test #6 30.5 to Bot. (65.7)
10 psi. - 2.5 gpm.
20 psi. - 5.0 gpm.
30 psi. - 6.8 gpm.
20 psi. - 4.0 gpm.
10 psi. - 2.8 gpm.

Location CORNBURN, Va

BORING LOG

Structure DAM SITEComm. No. 897-AGeologist BrufSheet 1 of 2Contractor C.C. D

Engineer

Boring No. D-2aDate 6 June 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>61.5'</u> Rock <u>54.4'</u> Wt of hammer <u>140#</u> Av fall of ham <u>30"</u> El of grd. water
56.2	0.0						REMARKS
			ALLUVIUM OVERBURDEN. sand, silt, clay, cobbles & boulders. Boulders very weathered, micaceous, coarse sandstone.				Hole off set 11.5 ft. from plans location see plans. WT @ 72 hrs. - 22.5 ft casing bit to 4.8 ft.
51.4	4.8		21. to med. gray gray med. soft.				core rec. 4.8 to 6.0'
50.2	6.0		to med. hard lightly weathered SHALE.				75%
49.1	7.1		lt. to med. gray med. hard, lightly weathered SHALE.				
	10.0						core rec. 6.0 to 11.0 90%
45.2	11.0						
							core rec. 11.0 to 20.7 95%
			alternating med. soft to med. hard (8" - 15")				
	20.0						
35.5	20.7						
32.3	23.9		lt. gray, weathered, slightly bedded SHALE with clay partings				
31.0	25.2		21. to med. gray med. hard, lightly weathered SHALE				core rec. 20.7 to 31.0 98%
28.9	27.3		Thinly bed. lt. gray SHALE.				
27.7	28.5		Med. weathered w/ clay partings				
26.2	30.0		Med. hard, thin bedded lightly weathered SHALE				

Location Cashburn, Va. BORING LOG Comm. No. 891-A
 Structure Dam Site Sheet 2 of 2
 Geologist J. E. R. Boring No. 1-6
 Contractor C. C. D. Engineer Date 7 June, 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole 61.5'
26.2	30.0						Rock 54.4'
25.2	31.0		badly broken, weathered, lt gray, med soft SHALE. CLAY part				Wt of hammer 140#
23.9	32.3		thin bedded weathered, gray SHALE				Av fall of ham 30"
22.7	33.5		Med hard, med gray lightly weathered SHALE.				El of grd. water
22.1	34.1		Hard, light, dense, lt gray, slightly micaceous, slightly weathered, fine grained SAND-STONE				REMARKS
20.1	36.1		Med hard, med gray, lightly weathered thinly bedded				core rec. 22.7 to 31.0 96%
18.7	37.5		lightly fractured SHALE				lost circ. @ 33.5 ft.
17.7	38.5		some fracturing along bedding plane, thin (1") med. weathered areas.				core rec. 31.0 to 37.5 95%
15.4	40.5						core rec. 37.5 to 40.8 82%
14.9	41.3						core rec. 40.8 to 41.3 60%
14.3	41.9						core rec. 41.3 to 41.9 20%
13.9	42.3						41.9 to 42.3 EX Core
12.9	43.3						42.3 to 43.3 - drill fell into
12.5	43.7		thin bedded, light, weathered gray, med. hard SHALE.				believed to be clay, some 5' thick.
							core rec. 41.9 to 46.0 77%
8.2	48.0						core rec. 46.0 to 52.3 83%
	51.1						Severe polishing later piece. Try of 1963 unknown
3.9	52.3						core rec. 52.3 to 57.5 97%
			No change in lithology				
98.7	57.5						core rec. 57.5 to 61.5 95%

Location COEBURN, VA

BORING LOG

Structure DAM SITEComm. No. 897-AGeologist LongSheet 1 of 3Contractor C.C.D.

Engineer _____

Boring No. D-7Date 18 JUNE 1963

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole <u>78.4'</u>
2310.0	0.0						Rock <u>65.0'</u>
							Wt of hammer <u>140^{lb}</u>
							Av fall of ham <u>30"</u>
							El of grd. water <u>66.7</u>
							REMARKS
							WT@12 hrs. <u>28.3</u>
			OVER BARDEN and RESIDUAL MATERIAL clay, sand, Boulders.				fish tail to 6.2
03.6	6.2		very badly weathered, very soft, lt. brown SHALE, plastic CLAY				core rec. 6.2 to 11.8 73%
01.3	8.7		badly weathered, broken & fractured black SHALE				
00.2	9.8						
00.0	10.0		COAL and interbedded SHALE				
96.6	13.4		very fine grained, dense, med. hard, weathered lt. gray SANDSTONE grading downward into SLTSTONE CLAY Partings Some fossil content				core rec. 11.8 to 21.3 82%
93.7	16.3		lt. to dk. gray, badly weathered, med. soft, badly fractured SHALE CLAY				
91.8	18.2		med. hard, slightly weathered med. to coarse grained, lt. gray SANDSTONE				
90.9	19.1						
90.0	20.0		lt. gray, weathered, soft, fractured SHALE and CLAY				
88.7	21.3		clay seam 21.3 to 21.6				
88.4	21.6						test core. 23.6
86.4	23.6						
84.9	25.1		fine to med. grain, lt. gray, med. hard SANDSTONE				core rec. 21.3 to 31.3 97%

Location Cochran, Va.

BORING LOG

Structure Dam SiteComm. No. E97-2Geologist J. E. P.Sheet 2 of 2Contractor C.C.D.Engineer J. E. P.Boring No. 0-7Date 18 June 1962

Stratification			Description of Materials (Type, color & Consistency)	Sampler or Spoon		Sample No.	Misc. Data
Elevation	Depth	Legend		Blows	Penetration		Lnth of hole 78.4'
80.0	30.0						Rock 65.0'
78.7	31.3		fine to med grained, lt. gray, med. hard SANDSTONE Intermittent SHALE lenses				Wt of hammer 140 ^{lb}
							Av fall of ham 30"
							El of grd. water 66.7
							REMARKS
							core rec. 31.3 to 39.2
							96%
			No change in lithology				core in one piece 78
70.8	39.2						
70.0	40.0						
69.8	40.2						
			Med. soft to med. lt. gray thin bedded, slightly wavy layered SANDY SHALE.				core rec. 39.2 to 46.0
							95%
							2 pco. core. 4.6
							5.2
			Gradual increase in shale and decrease in sand with depth.				
62.0	48.0						
60.0	50.0						
							core rec. 48.0 to 58.0
							100%
52.0	58.0						
51.6	58.4		Plastic, clay and very soft, wavy layered, dr. gray SHALE. Plugged barrel.				core rec. 58.0 to 58.4
							50%

Comm. No. *EG7-A*

Structure *Dam site*

Sheet 3 of 3

Geologist David

Boring No. D-7

Engineer

Date 19 June 1963

[illegible]

D-7

Test #1 18.5 to 23.5

10 psi. - 0.0 gpm.
20 psi. - 0.3 gpm.
30 psi. - 1.0 gpm.
20 psi. - 0.3 gpm.
10 psi. - 0.0 gpm.

Test #2 23.5 to Bot. (78.4)
No pressure - 14.5 gpm.

Test #3 23.5 to 28.5

9 psi. - 12 gpm. (pressure
fall off to zero)

Test #4 28.5 to Bot. (78.4)

10 psi. - 3.8 gpm.
20 " - 5.5
30 " - 6.5
20 " - 4.0
10 " - 3.8

Test #5 13.5 to 18.5

10 psi. - 1.3 gpm
18 (max) - 11.5 "
10 psi. - 5.8 "

APPENDIX V - REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Department of Army, Office of the Chief of Engineers, 46 pp.
2. Design of Small Dams, U. S. Department of Interior, Bureau of Reclamation, 1974, 816 pp.
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4. Section 4, Hydrology, Part 1 Watershed Planning, SCS National Engineering Handbook, Soil Conservation Service, U. S. Department of Agriculture, 1964.
5. Hydrometeorological Report No. 33, U. S. Department of Commerce, Weather Bureau, U. S. Department of Army, Corps of Engineers, Washington, D. C., April 1956.
6. Technical Paper No. 40, U. S. Department of Commerce, Weather Bureau, Washington, D. C., May 1961.